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FOREST SURVEY RELEASE NO. 37

OCTOBER 18, 1938

FOREST RESOURCES
of
SOUTHEAST OKLAHOMA

A Progress Report
by
THE SOUTHERN FOREST SURVEY
I. F. Eldredge
Regional Survey Director

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FOREWORD

The nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is : (1) to make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made April 25, 1936, to June 13, 1936, and on a field canvass of forest industrial plants to determine forest drain, which was completed during March, 1937. It should be regarded only as a progress report since it contains Forest Survey data that will be included in complete reports to be published later, and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the presentation of these survey data, it is to be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Staff Assignment

In Charge of Field Work and Preparation of Report
James W. Cruikshank - Associate Forest Economist

In Charge of Computations
P. R. Wheeler - Associate Forest Economist

Note: The Southern Forest Experiment Station hereby wishes to acknowledge the clerical assistance received from the Works Progress Administration in the preparation of this Release.

FOREST RESOURCES OF SOUTHEAST OKLAHOMA

General Description of the Unit

The portion of Oklahoma treated in this report consits of Haskell, Le Flore, Latimer, Pushmataha, and McCurtain Counties, in the extreme southeast corner of the State (see fig. 3). Since these counties embrace practically all of the Ouachita Mountain system in Oklahoma, their topography is rougher than that of any other section of the State. Of the 4,026,200 acres in the five counties, forest land occupies 73.5 percent. Agriculture, coal mining, and lumbering are the chief industries. Poteau and Idabel, which are the largest towns, each contain less than 5,000 people. Because of the relatively low soil productivity, agricultural use of the land fluctuates rapidly with changing economic and climatic conditions. In general, the most promising economic use of the major part of the land seems to lie in growing timber, a fact recognized by the Federal Government, which has over 140,000 acres of forest land under management in the part of the Ouachita National Forest that is in Le Flore County.

One of the important factors affecting the development of the area is its rugged topography. With the exception of the fairly broad alluvial valleys along the Arkansas and the Red Rivers, the land surface is characterized by parallel northeast-southwest ridges, which increase gradually in height toward the east, until a maximum elevation of 2,900 feet is attained near the Oklahoma-Arkansas line. These ridges, which are generally narrow, with steep slopes and sharp crests, are covered with thin and unproductive soil. The stream valleys between the ridges offer the best opportunity for successful agriculture, but their area is limited. In the northern half of the unit, drainage is by way of such streams as the Canadian, Sansbois, Brazil, and Poteau, which flow northward into the Arkansas River on the northern boundary. The Red River flows southeastward along the southern boundary and receives from the southern half of the unit the run-off carried into it by the Kiamichi and Little Rivers with their tributaries. Based upon a preliminary reconnaissance by the Soil Conservation Service in 1934, about 70 percent of the unit is subject to severe sheet erosion, with moderate sheet erosion occurring on a large part of the remaining land.

Transportation facilities are less adequate in this area than in any other part of Oklahoma, owing largely to the rugged topography and the scarcity of population. Three Federal highways cross the unit as well as several State highways, but paving is restricted to a few miles adjacent to some of the larger towns. Using a sampling process, the Bureau of the Census determined in 1930 that 90 percent of the farms were located on dirt roads. The first railroad to penetrate the region was the St. Louis and San Francisco, which started operation in 1886. The major part of the railroad construction was finished by 1910, since which time the mileage has remained relatively constant. At present there are seven railroad systems operating in the unit, but their distribution leaves a large part of the area without convenient rail service.

Between 1820 and 1840 a considerable number of Choctaw Indians were transferred to this part of Oklahoma. According to the Census of 1930, the Indian population was about 7,000; while the total population numbered 120,000, only 5 percent of which was classified as being in towns of over 2,500. In the period from 1930 to 1935, about 5,000 persons moved from a non-farm residence to a farm home; and the transitory nature of the farm population is evidenced by the fact that 70 percent of all the farm operators had moved at least once during this period.

About 60 percent of the people are engaged in farming, in many cases supplementing their incomes by part-time work in the woods. The Agricultural Census of 1935 shows that farm operators received pay for about 382,000 man-days of labor not connected with their farms. A large part of this employment was in the forest industries, which in 1930 provided the chief income to nearly 10 percent of the wage-earners in the area. Also, the sale of forest products provided additional income; in 1934 this amounted to almost $30.00 per farm on those farms reporting sales. Coal mines in Latimer, Haskell, and Le Flore Counties furnished some employment, and have been responsible for the growth of such towns as Poteau, Wilburton, and Red Oak.

Data gathered by the Agricultural Census of 1935 show that there has been a 5 percent increase in number of farms since 1925. The average farm contained 82 acres, of which 32, or nearly 40 percent, were forest land. Although the acreage in farms has increased about 23 percent since 1925, the amount of cropland actually harvested has decreased 20 percent during this period. Crop failure increased from 8,000 acres in 1924 to 58,000 acres in the dry year of 1934, when crops failed on 12 percent of all the land planted. General farming is practiced, with cotton, corn, cattle, and forage crops the chief products. The acreage in cotton has been reduced from 208,000 acres in 1929 to 136,000 acres in 1934, when the yield amounted to only 0.17 bales per acre, owing in part to drought conditions and in part to the general low productivity of the soil. Le Flore County grew over 4,000 acres of Irish potatoes for market in 1934; while McCurtain County harvested 1,400 acres of potatoes that year and 369,000 bushels of corn.

The acreage of land held in public ownership is relatively small. The portion of the Ouachita National Forest situated in Oklahoma contains 144,000 acres. There are also 21,000 acres in State Parks and County Game Preserves. School lands may total as much as 4,000 acres. In private ownership is the 1,315,000 acres of land in farms, divided into 16,100 individual tracts, only 32 percent of which are operated by their owners, while 60 percent are operated by tenants and 8 percent by share croppers. In many cases the ownership of these farms is difficult to determine, owing to the prevalence of chronic tax delinquency. Any program for promoting good forest practice in this unit must take into account the fact that over half a million acres of woodland is managed by 16,100 operators, only 32 percent of whom are actual owners of the land. Lumber companies own large blocks of land, a single company owning at least one-half million acres. Coal companies own some land but also hold extensive leases. A large part of the leased land was originally the tribal property of the Choctaw Indians, who received a royalty for each ton of coal mined, but the present status of the ownership and acreage of the coal lands has not been determined.

The area in tax default for 3 years or longer as of August 1934, amounted to 28 percent of the total area of the unit. The situation was extremely bad in Latimer County, where a large part of the gross area was in default. As a rule, more tax default occurs on small farm holdings than on land owned by lumber companies or other corporations. Aggravating the excessive delinquency, is the high rate of interest (12 percent) charged upon overdue taxes. If taxes once become delinquent, it is often impossible for many of the small farmers to ever catch up with the accumulating taxes, interest, and costs, owing to their narrow margin of profit, which is all too frequently wiped out by adverse climatic or economic conditions.

In table 1, the acreage of land is classified according to the prevailing type of land use, as determined by the Forest Survey in 1936. It is noticeable that nearly three-fourths of the unit is forest land, while idle and abandoned land, much of which will revert to timber, is found on an additional 5 percent of the area.

Table 1. - Land area classified according to land use

Land use	Area		Proportion of total area	
	Acres		Percent	
Forest:				
Productive	2,961,000		73.5	
Nonproductive	-		-	
Total forest		2,961,000		73.5
Nonforest:				
Agricultural:				
In cultivation:				
Old cropland	588,300		14.6	
New cropland	26,300		.7	
Out of cultivation:				
Idle	141,700		3.5	
Abandoned	62,900		1.6	
Pasture	192,700		4.8	
Total agricultural	1,011,900		25.2	
Other nonforest	53,300		1.3	
Total nonforest areas		1,065,200		26.5
Total forest and nonforest		4,026,200		100.0

Description of the Forest

The forests of the unit are composed of a number of species. Most common is the shortleaf pine, which occurs in practically pure stands on almost a quarter of the forest area and in mixture with oaks and hickories on an equivalent area. The pine and pine-hardwood stands are closely intermingled and together constitute the characteristic forest of the Ouachita Mountains. In Haskell County, the northern part of Le Flore County, and in McCurtain County south of Broken Bow, the uplands support a stand composed chiefly of post and red oaks, hickories, some forked-leaf white oak, and other miscellaneous hardwood species. In the river bottoms, notably those of the Arkansas, Canadian, and Red Rivers, the more abundant species are water oaks, red gum, hickories, elms, maple, and sycamore.

Forests occur on all the topographic situations that exist in the unit. There is, however, a concentration of agricultural use in the more fertile stream valleys and level benches between the ridges, resulting in a greater proportion of the ridge land being forested. Even though such is the case, table 2 shows that 48 percent of the forests are on slopes of not more than 10 percent and should therefore be easy to log.

Table 2. - Forest area classified according to forest type-group and topographic situation

Forest type-group	Slopes			River bottom	Total	Proportion of total
	10 percent or less	More than 10 percent				
		North	South			
	Acres					Percent
Pines	271,500	177,600	246,000	2,400	697,500	23.5
Pine-hardwoods	318,500	175,100	183,200	9,500	686,300	23.2
Upland hardwoods	835,200	289,800	219,700	-	1,344,700	45.4
Bottom-land hardwoods	-	-	-	232,500	232,500	7.9
Total all types	1,425,200	642,500	648,900	244,400	2,961,000	100.0
Percent of total forest area	48.1	21.7	21.9	8.3	100.0	

The stands included in the pine type-group (table 3) are practically "pure" pine. Shortleaf pine is the dominant species, but a minor amount of loblolly pine also is present, particularly along the streams, as well as a small quantity of oak and hickory. Old-growth stands are more extensive in this type-group than in any other, occurring on 28 percent of the type area. Second-growth sawlog-size stands occupy 64 percent, leaving only 8 percent of the area of this type-group in stands below merchantable size. Shortleaf is also the leading species in the pine-hardwoods type-group, but the combined volume of the hardwoods nearly equals that of the pine. This type-group has 13 percent of its area in old-growth stands, 32 percent in second-growth sawlog-size stands, and 55 percent in stands below sawlog size. Much of the pure pine type-group described above may become a pine-hardwoods type upon the removal of the merchantable pines, which under present markets would tend to reduce the value of the stand.

The upland hardwoods type-group is quite extensive in this unit, occurring on 45 percent of the forest land. It is characteristically a forest of small, low-quality trees, as stands below sawlog size occupy 75 percent of the type-group area. The stands on the 25 percent of the area classified as bearing sawlog-size stands are generally upon the more fertile soils, where moisture conditions favor increased growth. The bottom-land hardwoods type-group is located upon some of the most fertile land in the unit. Old-growth timber in scattered tracts occupies 24 percent of the acreage in this type-group, sawlog-size second growth 30 percent, and young second growth 46 percent.

Table 3. - Forest area classified according to forest condition and forest type-group

Forest condition	Pines	Pine-hardwoods	Upland hardwoods	Bottom-land hardwoods	Total all types	Proportion of total
	Acres					Percent
Old growth:						
Uncut	153,700	51,000	55,700	22,300	282,700	9.5
Partly cut	42,200	37,400	52,600	32,600	164,800	5.6
Total	195,900	88,400	108,300	54,900	447,500	15.1
Second growth:						
Sawlog size:						
Uncut	237,200	128,200	113,000	34,300	512,700	17.3
Partly cut	208,600	93,200	114,600	36,600	453,000	15.3
Under sawlog size	53,400	369,400	939,500	100,300	1,462,600	49.4
Reproduction	2,400	7,100	[1] 69,300	[1] 6,400	85,200	2.9
Total	501,600	597,900	1,236,400	177,600	2,513,500	84.9
Total all conditions	697,500	686,300	1,344,700	232,500	2,961,000	100.0
Percent of total forest area	23.5	23.2	45.4	7.9	100.0	

[1] Includes 800 acres of clear-cut condition

The species composition of the several type-groups is portrayed in figure 1, in which the net cubic volume in each of the four species-groups is expressed as a percentage of the total net cubic volume in the type-group. The species-groups as combined are: (1) pines, chiefly shortleaf but including a small amount of loblolly and cedar; (2) red, black, and tupelo gums with other pulping hardwoods; (3) oaks, including scrub oak; and (4) hickories, elms, sycamore, ash, etc. In both the pine and pine-hardwood type-groups, post oak is the most common hardwood, with red oaks a close second. In the upland hardwoods type-group, the more abundant species are post oak, red oak, hickories, forked-leaf white oak, and scrub oak. This latter species makes up 9 percent of all the volume in this type-group, exceeding both the pines and gums in quantity. In the bottom-land hardwoods type-group, over half of species-group (4) above is made up of various elms.

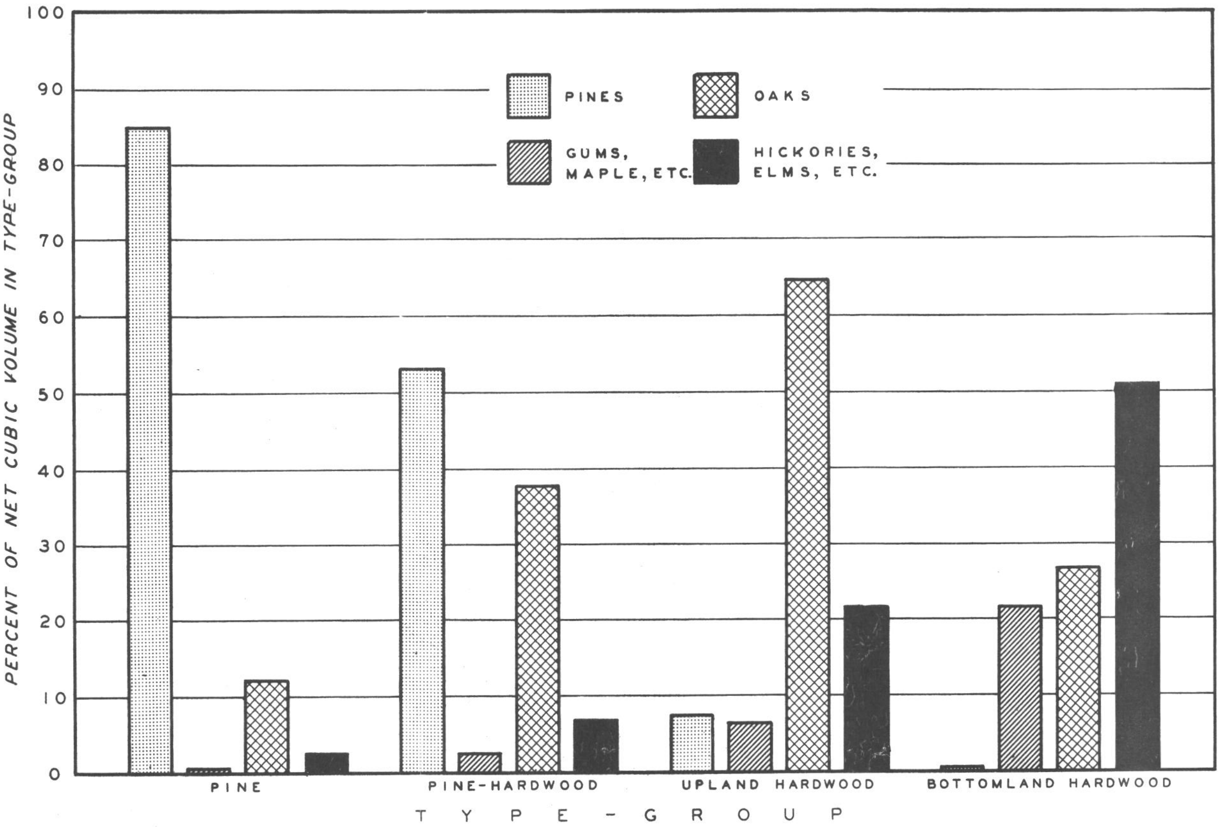

FIGURE 1 – SPECIES COMPOSITION OF FOREST TYPE-GROUPS.

An appraisal of the average basal area [1] per acre in the second-growth sawlog-size pine types indicates that the stocking, when measured in this way, is low. In these stands in Oklahoma, the basal area is less than 40 square feet per acre, while in nearby Texas basal areas of comparable pine stands average 70 square feet per acre. The poorer forest sites which are due in part to the lower fertility of the Oklahoma soil, may prohibit a normal stocking equal to that possible in Texas, but the opportunity for improvement is indicated in figure 2, which shows that the volume of the average stand is about half of what it might be with reasonable care.

Figure 2 is a comparison of the age-class and volume distribution in the present pine and pine-hardwood forest, totaling 1,383,800 acres, with the corresponding distribution in a forest managed on a 90-year rotation. The present forest is divided into areas dominated by specific age-classes, with their extent indicated by percentages along the horizontal axis of the figure, while

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1/ The basal area is the sum of the areas of the cross sections of the trees at breast height, and in this report is expressed in square feet.

the managed forest is divided into nine equal areas, each containing one 10-year age-class. The volumes per acre shown for the given age-classes of the unmanaged forest are the averages of all the stands in the respective classes, while those of the managed forest are based upon the best stocked 10 percent of the uncut forest stands of weighted-average site in the pine and pine-hardwood types. The volumes used for the managed forest do not necessarily equal the ultimate volume attainable under management, but since they have actually been produced by the better-stocked stands now growing in the unit, they serve as a conservative measure of the potential growth of the forest.

If the managed forest is a close approach to the ideal, as related to volume per acre and area distribution of the age-classes, it is apparent that the present stand has certain deficiencies that should be remedied if maximum, continuous production is to be achieved. Among these are: (1) the present stocking is much less than it should be, as it is only 50 percent of the volume of the managed stands; (2) the distribution of age-classes is unsatisfactory, in that the area in stands over 80 years of age is about three times what it should be, while the area of stands below 21 years of age is only one-fifth of what is desirable; and (3) the presence of such a large area (37 percent) of mature timber is a threat to the early establishment of sustained yield in the unit, since these stands are ripe and ready for complete harvesting. If this large area is clear-cut within the near future, it will leave the forest still further out of balance from the standpoint of age-class distribution. The solution of this problem might involve selective logging of the old-growth stands, in which a part of the trees would be left under improved growing conditions as a nucleus of the next cut.

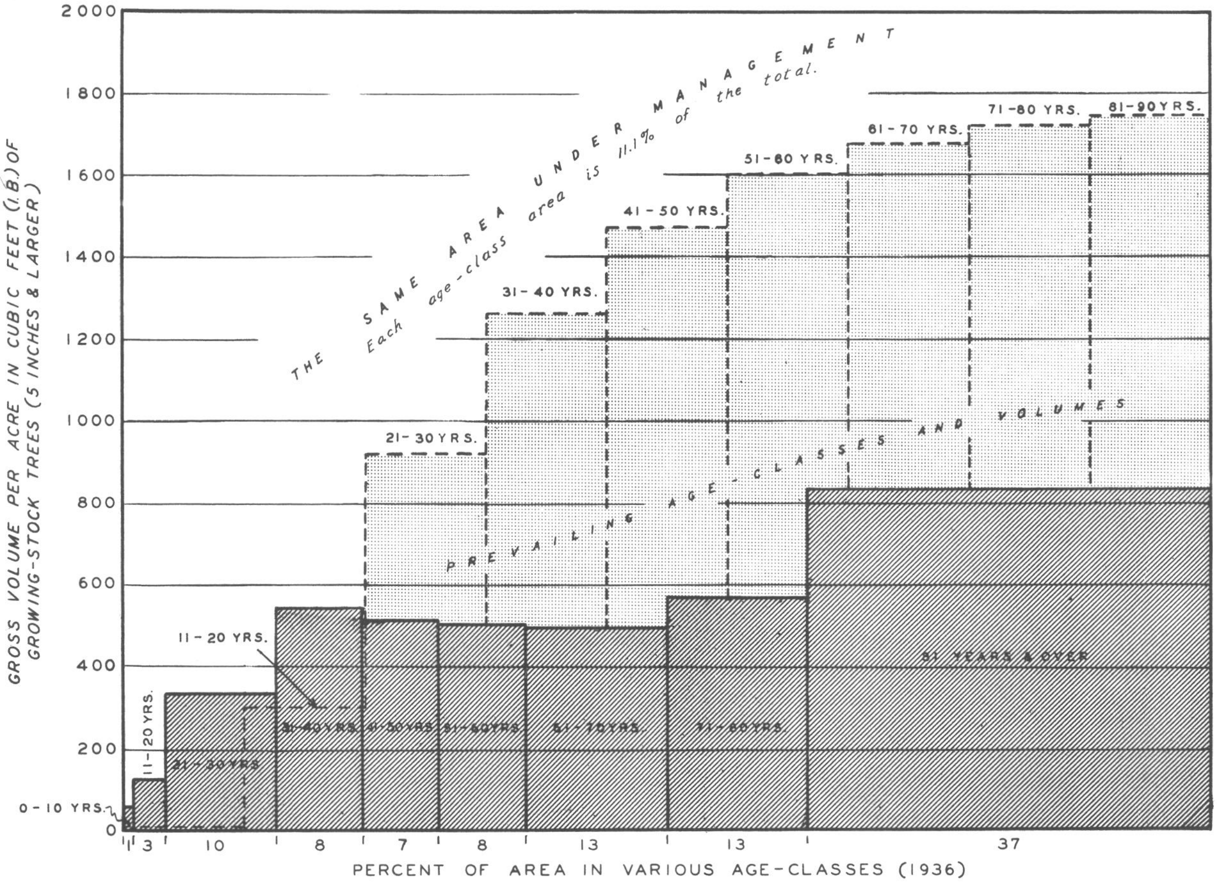

FIGURE 2 - PREVAILING AGE-CLASS AND VOLUME DISTRIBUTION COMPARED WITH THAT ON THE SAME AREA UNDER MANAGEMENT (BASED ON PINE AND PINE-HARDWOOD TYPE-AREAS OF 1,383,800 ACRES).

Volume Estimates

Board-foot volume

The estimate of the volume in sound saw-timber trees is given in table 4, expressed in terms of board feet as measured by the Doyle log rule. To be included in this estimate, hardwoods must be at least 13.0 inches in diameter at breast height (d.b.h.) outside bark, and pines 9.0 inches; also each tree must contain at least one 12-foot butt log, or have 50 percent of its gross volume in sound material. Top diameters vary with the limits of usable material, but neither hardwood logs less than 8.5 inches in diameter at the small end nor pine logs less than 5.5 inches were included. Deductions were made for woods cull, such as rot, fire-scar, crook, limbiness, and similar defects, as well as for loss in sawing at the mill due to sweep and hidden defects. The volumes given here, therefore, can be considered net log scale.

Table 4. - Net volume (Doyle) classified according to species-group and forest condition

Species-group	Old growth		Second growth		Total	Proportion of total
	Uncut	Partly cut	Sawlog size	Under sawlog size		
	Thousand board feet					Percent
Pines:						
Shortleaf [1]	645,200	122,800	629,500	71,700	1,469,200	65.1
Pulping hardwoods:						
Red gum	15,500	15,400	21,600	2,200	54,700	2.4
Black and tupelo gums	9,400	13,100	9,800	3,000	35,300	1.6
Others	3,200	4,900	8,900	2,700	19,700	.9
Nonpulping hardwoods:[2]						
Red oaks	54,900	41,000	108,600	16,200	220,700	9.8
White oaks	58,900	22,400	37,900	9,100	128,300	5.7
Post oaks	24,100	25,000	98,400	22,200	169,700	7.5
Hickories	7,500	17,600	20,500	13,500	59,100	2.6
Others	21,000	19,700	47,100	12,300	100,100	4.4
Total hardwoods	194,500	159,100	352,800	81,200	787,600	34.9
Total all species	839,700	281,900	982,300	[3]152,900	2,256,800	100.0
Percent of total	37.2	12.5	43.5	6.8	100.0	

[1] Includes 29,600 M board feet of loblolly pine and 1,900 M board feet of cedar.

[2] Includes species not commercially pulped at present, although some have been used experimentally.

[3] Includes 2.5 million feet on the area classified as reproduction.

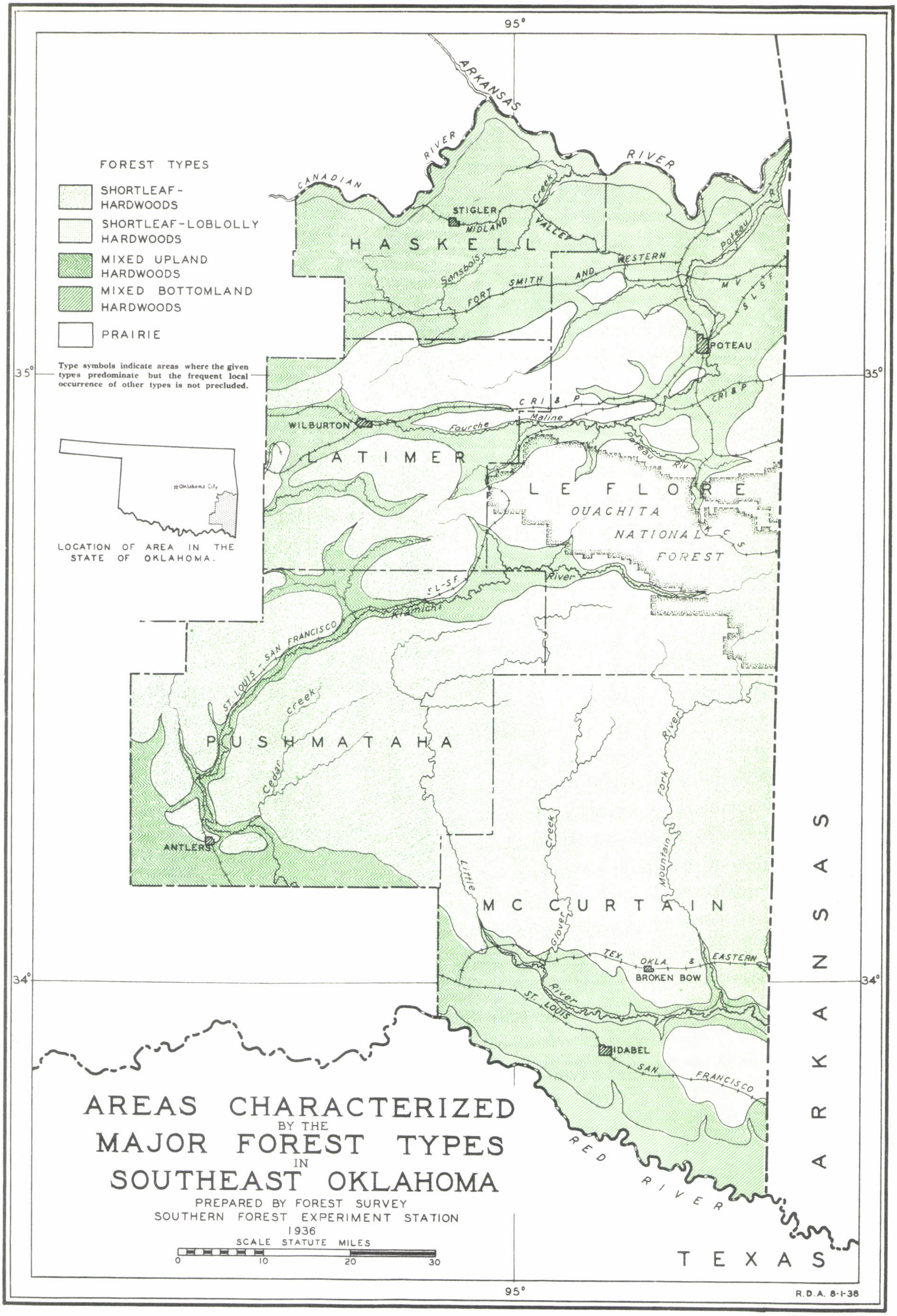
95°
FOREST TYPES
SHORTLEAF-HARDWOODS
SHORTLEAF-LOBLOLLY HARDWOODS
MIXED UPLAND HARDWOODS
MIXED BOTTOMLAND HARDWOODS
PRAIRIE
Type symbols indicate areas where the given types predominate but the frequent local occurrence of other types is not precluded.
35°
34°
LOCATION OF AREA IN THE STATE OF OKLAHOMA.
Oklahoma City
ARKANSAS
CANADIAN
RIVER
RIVER
STIGLER
MIDLAND
VALLEY
Creek
HASKELL
Sansbois
FORT SMITH AND WESTERN
Poteau
R.
M V
S L S F
POTEAU
CRI & P
CRI & P
WILBURTON
Fourche
Maline
Poteau Riv
LATIMER
LE FLORE
OUACHITA
NATIONAL
FOREST
K C S
River
SL-SF
Kiamichi
ST. LOUIS - SAN FRANCISCO
creek
Cedar
PUSHMATAHA
ANTLERS
Little
Creek
Glover
Mountain
Fork
River
MC CURTAIN
TEX. OKLA. & EASTERN
BROKEN BOW
River
ST. LOUIS
IDABEL
SAN
FRANCISCO
RED
RIVER
ARKANSAS
TEXAS
AREAS CHARACTERIZED BY THE MAJOR FOREST TYPES IN SOUTHEAST OKLAHOMA
PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1936
SCALE STATUTE MILES
0
10
20
30
R.D.A. 8-1-38

FIGURE 3 - FOREST TYPE MAP.

Table 4 shows that the total volume is 2,256,800,000 board feet, 65 percent of which is pine and the remainder mixed hardwoods. More than half of the pine volume is found in old-growth stands, a large proportion of which belongs to a single lumber company. About 66 percent of the total pine volume is in trees 13.0 inches d.b.h. or over. The total hardwood volume is estimated to be 787,600,000 board feet, 45 percent of which is in old-growth stands. Much of the hardwood saw timber is of low quality; only 36 percent of the volume is in trees larger than 18.9 inches d.b.h. The greatest volume is in the red oaks, with that in post oak nearly as great. The most valuable, considering quality and volume, is the 128,300,000 board feet of white oak.

While the Doyle rule is generally used by lumbermen in southeast Oklahoma, a more accurate measure of the board-foot volume is obtained with the International $\frac{1}{4}$-inch rule, which, as used throughout this report, is the equivalent of green lumber tally. The volume by this rule, as presented in table 5, is nearly 3-2/3 billion board feet, or 60 percent more than when measured by the Doyle rule.

Table 5. — Net volume, lumber tally, classified according to species-group and forest condition (based on International $\frac{1}{4}$-inch rule)

Forest condition	Pines	Red and black gums, etc.	Red and white oaks, etc.	Total
	Thousand board feet			
Old growth:				
Uncut	954,500	39,000	225,500	1,219,000
Partly cut	193,100	43,000	168,000	404,100
Second growth:				
Sawlog size	1,208,600	59,300	447,100	1,715,000
Under sawlog size 1/	158,100	12,600	112,000	282,700
Total all conditions	2,514,300	153,900	952,600	3,620,800

1/ Includes 4.9 million feet on the area classified as reproduction.

Analysis of the data in tables 3 and 5 brings out the fact that a large proportion of the volume is concentrated upon a relatively small part of the forest area. Although the old-growth condition occupies only 15 percent of the forest area (table 3), it contains 1,623,100,000 board feet, or 45 percent of the total volume (table 5). Volumes per acre, while not high, average 4,310 board feet for all types in old-growth uncut stands. In the pure pine type-group of the old-growth uncut condition, the average stand per acre is 5,670 board feet; in the pine-hardwoods, 2,930 board feet; in the upland hardwoods, 2,060 feet; and in the bottom-land hardwoods, 3,690 board feet.

The second-growth stands occupy 85 percent of the forest area, but contain only 55 percent of the board-foot volume; they therefore have a much smaller volume per acre than the old-growth stands. In the second-growth uncut sawlog-size condition, the average stand, all types combined, is 2,070 board feet; while the pure pine type-group averages 2,800 board feet, the pine-hardwoods 1,670 feet, the upland hardwoods 1,060 feet, and the bottom-land hardwoods 1,850 board feet. Although the second-growth stands have a smaller volume per acre, the relative board-foot volume by species is much the same as in the old-growth condition.

Accessibility is not a determining factor in the utilization of the timber stands, as modern logging methods function efficiently in the most rugged topography of this unit. More important is the presence of sufficient volume per acre to warrant logging operations at the present time, while leaving the stand in good condition for further production.

In figure 4 the distribution of the 2,887,400 M board feet (gross volume) on the 951,500 acres in the sawlog-size conditions of the pine and pine-hardwood type-groups is shown according to volume-per-acre classes. Stands with less than 2,000 board feet per acre occur on 46 percent of the area and contain 19 percent of the volume. Although practically all of these light stands have sufficient volume to support a logging operation now, greater yields will be obtained in the future if present cutting is restricted to thinnings, and the removal of dying and cull trees, leaving the better trees to increase in volume and quality. About 41 percent of the total volume is found in stands of more than 5,000 board feet per acre, concentrated on less than 150,000 acres largely in private ownership.

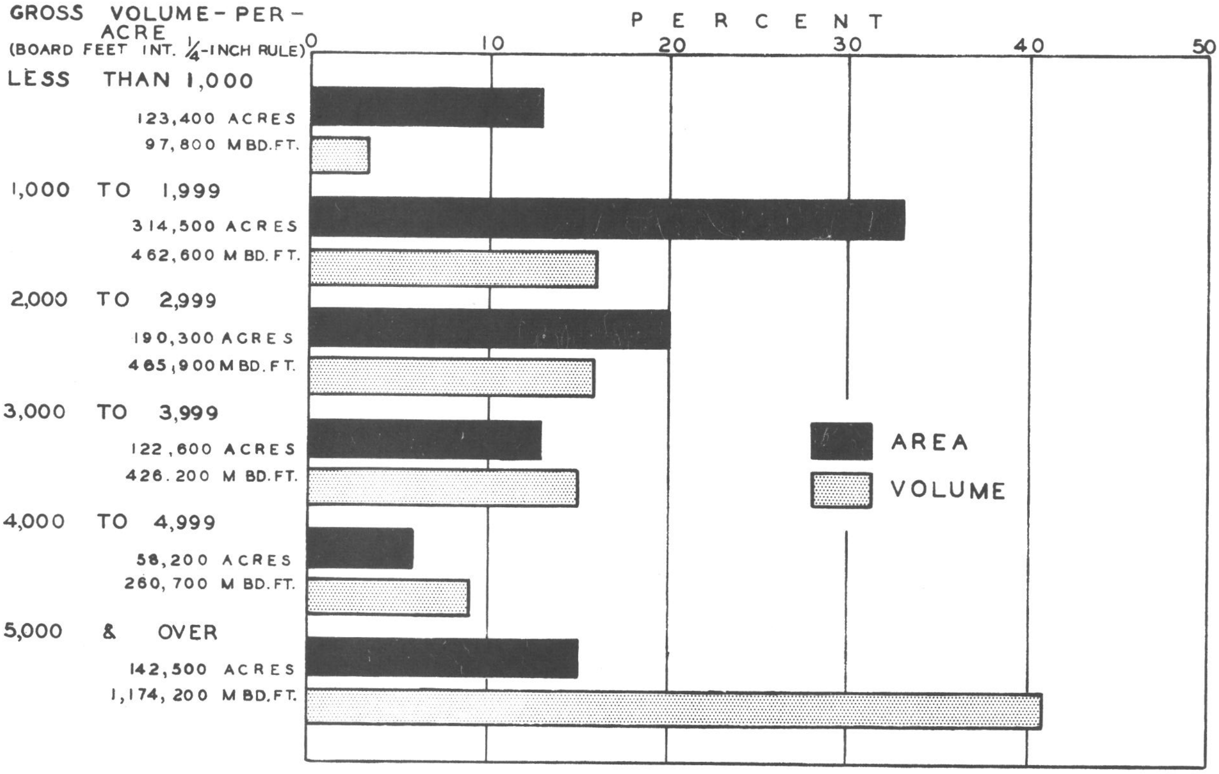

FIGURE 4.- PROPORTIONAL AREA AND VOLUME OF THE SAWLOG-SIZE CONDITIONS IN THE PINE AND PINE-HARDWOOD TYPES, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

Cordwood volume

The estimate of cordwood volume, as shown in table 6, includes the entire stand of sound trees at least 5.0 inches d.b.h., outside bark, and in addition the net sound volume in cull trees 5.0 inches d.b.h. or larger. These volumes are expressed in terms of standard cords (4 x 4 x 8 feet), containing 90 cubic feet of pine or cypress wood with bark, and 80 cubic feet of hardwood including bark. The volume shown under "sound trees sawlog size" includes only the merchantable sawlog portion of saw-timber trees. The portion of the stem above the sawlogs is given under "upper stems of sawlog-size trees," which in pines includes only the stem to a variable diameter but not less than 4 inches, while in hardwoods the usable limbs are also included to a 4-inch minimum diameter. Although "sound trees under sawlog size" include no limbs, they do include the full stems of both pines and hardwoods to a variable, usable top-diameter (but not less than 4.0 inches). The volume shown under "cull trees" is the estimated, sound, usable portion of such trees. Deduction from the volume of all trees is made for woods cull, such as rot, fire-scar, crook, bad knots, and other defects. While the volume shown for "upper stems" and cull trees is not used generally, it is nevertheless a potential source of supply.

Table 6. - Net volume in various classes of sound material, expressed in cords of wood with bark.

Species-group	Sound trees sawlog size	Upper stems of sawlog-size trees	Sound trees under sawlog size	Cull trees	Total all classes	Proportion of total
			Cords			Percent
Pines	5,537,200	637,900	1,852,600	85,500	8,113,200	33.3
Hardwoods:						
Pulping	386,600	210,200	520,700	319,200	1,436,700	5.9
Nonpulping	2,629,900	1,488,400	5,167,000	5,543,000	14,828,300	60.8
Total hdwds.	3,016,500	1,698,600	5,687,700	5,862,200	16,265,000	66.7
Total all species	8,553,700	2,336,500	7,540,300	5,947,700	24,378,200	100.0
Percent of total	35.1	9.6	30.9	24.4	100.0	

Pine makes up only one-third of the total cordwood volume in the unit. Sawlog-size trees contain the bulk of the pine cordwood volume, with 68 percent in the merchantable portion and 8 percent in the upper stems. Trees below sawlog size contain 23 percent of the cordwood volume, while the sound portion of sound and rotten cull trees, comprising only 1 percent of the total cordwood volume, is relatively unimportant. Pulping hardwoods are comparatively scarce in this unit, as only 6 percent of the total volume is in these species. On the other hand, the nonpulping hardwoods comprise three-fifths of all the volume in the unit. That they are predominantly small, low-quality trees is clearly illustrated by table 6, which shows that 72 percent of all the nonpulping hardwood volume is in sound trees under sawlog size and in cull trees.

According to present standards, the supply of cordwood in this unit is not particularly favorable for the establishment of a pulp industry. A large part of the pine volume is in old-growth timber that is being converted into high-grade lumber. If the lumber industry is to continue operating in this area, it is essential that the growing stock of younger trees be reserved from cutting to provide for a future supply of saw timber. While there is a considerable quantity of small, low-quality, nonpulping hardwoods, chiefly oaks, extensive research will be necessary to develop suitable manufacturing methods and new products before any great amount will be utilized.

In figure 5 is indicated the cordwood volume of sound trees, classified by species-group and diameter-class. Sound-tree volume, as used here, includes the full stems of pines and hardwoods below sawlog size but at least 5.0 inches d.b.h.; the full stems of merchantable pines to a variable (minimum 4-inch) top; and the saw-timber portion of sawlog-size hardwoods. The volumes shown here differ from those given in table 6 in that the sound volume in cull trees (including scrub oaks) and in tops and limbs of merchantable hardwoods is not included.

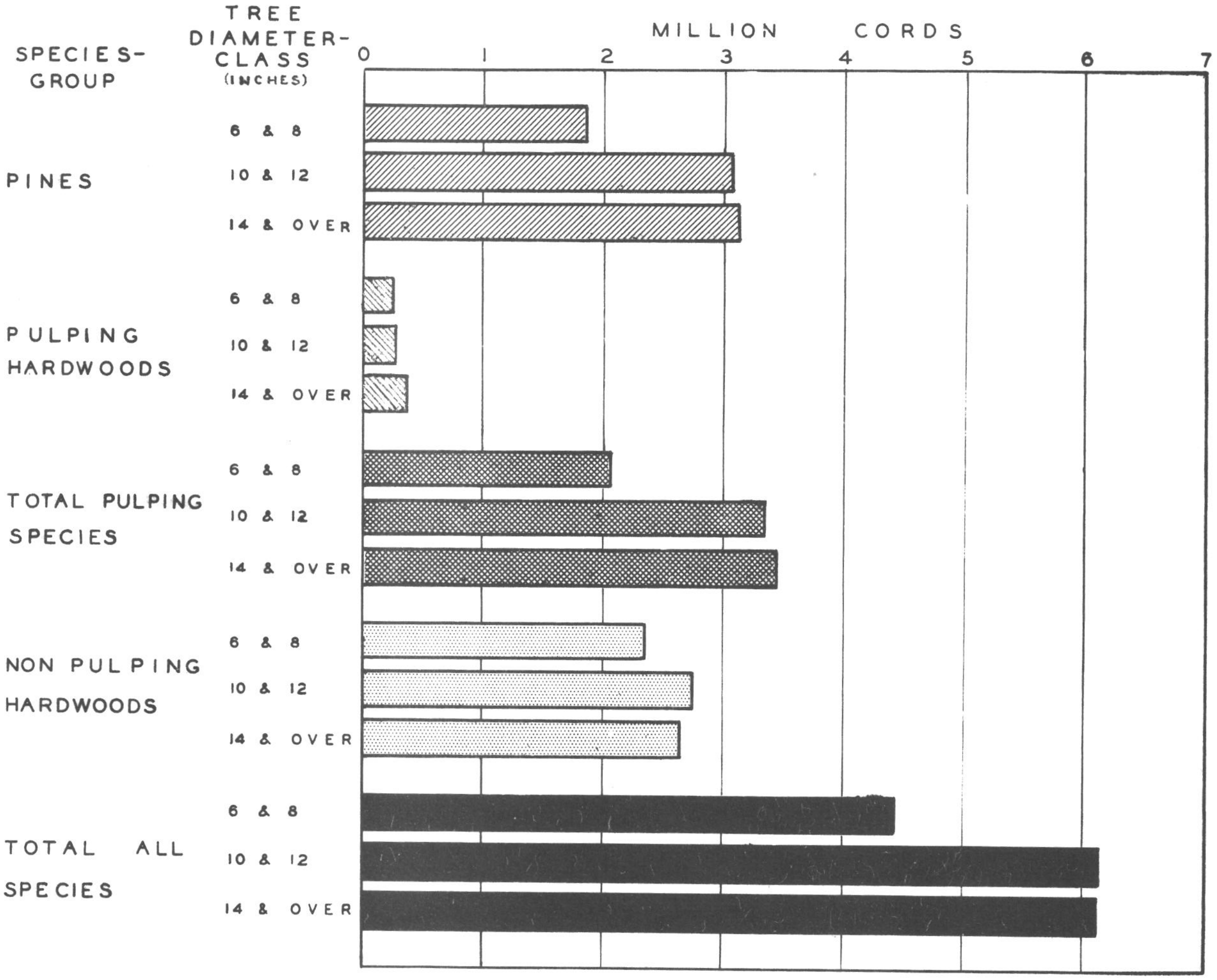

FIGURE 5 - CORDWOOD VOLUMES OF PULPING AND NONPULPING SPECIES.

Pine poles and piles

Included in previous volume estimates are a large number of pine trees that can be used for poles or piles. The number available for poles or piles in the various size- and length-classes is given in table 7, where the absence of trees suitable for the longer lengths is noticeable. For a more detailed presentation of the pole and pile situation, reference should be made to Forest Survey Release No. 28,[2] which is particularly valuable in comparing the pole and pile stands of this unit with those in nearby units.

Table 7. - Total number of pine poles or piles classified according to length and diameter

D.B.H. of trees (outside bark)	Pole or pile length (feet)					Total	Proportion of total
	20	25	30	35	40 or over		
Inches	Thousand sticks						Percent
7.0 - 8.9	619	137	48	-	-	804	20.2
9.0 - 10.9	664	285	74	31	-	1,054	26.5
11.0 - 12.9	487	409	144	66	-	1,106	27.8
13.0 - 14.9	118	283	129	58	-	588	14.7
15.0 - 16.9	20	129	102	42	-	293	7.4
17.0 - 18.9	-	43	67	27	-	137	3.4
Total	1,908	1,286	564	224	-	3,982	100.0
Percent of total	47.9	32.3	14.2	5.6	-	100.0	

Forest Increment

The annual increment of a forest stand is the net usable growth that results after mortality is subtracted from gross growth. It is measured by determining the difference in volume of the stand at the beginning and end of the year, before deducting the utilization drain for the year.

Forest increment of the unit

The actual volume changes in the forest growing stock due to increment are presented in table 8. It should be realized that the growing stock of the unit did not increase at the end of the year by the amount of the increment, since the volume of wood removed by the forest industries was considerably greater than the increment, with a consequent reduction in the forest stand.

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[2] "Pole and pile timber in the Pine-Hardwood Region——West," Forest Survey Release #28, Sept. 25, 1937, Southern Forest Exp. Sta., New Orleans, La.

The increment on the pine growing stock of 2½ billion board feet amounted to 94,300,000 board feet (lumber tally) in 1936 — a volume increase of almost 4 percent for the year. The old-growth pine stands produced 18 percent of the pine increment, sawlog-size second-growth stands produced 59 percent, and under-sawlog-size stands 23 percent.

In the hardwoods the increment on the 1.1 billion board feet of growing stock amounted to nearly 11 million board feet, equivalent to a volume increase of less than 1 percent. In the old-growth stands the loss due to mortality exceeded the annual increment by over 2 million board feet, leaving a net loss in growth. Very desirable would be a series of improvement cuttings in the old-growth hardwoods, with the object of anticipating mortality, in order that increment and mortality might both be used to satisfy drain requirements.

Table 8. - Forest increment in board feet and cubic feet in the various forest conditions, 1936

Forest condition	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	- - -	M board feet	- - - - - -	M cubic feet (inside bark)		
Old growth	16,900	-2,100	14,800	3,340	-2,300	1,040
Second growth:						
Sawlog size	56,000	2,100	58,100	12,370	160	12,530
Under sawlog size	21,300	10,900	32,200	8,050	3,240	11,290
Reproduction and clear-cut	100	negl.	100	40	negl.	40
Total all conditions	94,300	10,900	105,200	23,800	1,100	24,900

The increment is expressed in standard cords (4 x 4 x 8 feet) in table 9. All cordwood volumes in this report include bark, while all cubic-foot volumes are of wood only.

Table 9. - Forest increment in 1936, expressed in cords, in the various forest conditions

Forest condition	Pine	Hardwood	Total
	- - - - - - - - - -	Cords - - - - - - - - - -	
Old growth	42,400	-34,800	7,600
Second growth:			
Sawlog size	158,800	2,600	161,400
Under sawlog size	105,500	50,900	156,400
Reproduction and clear-cut	500	negl.	500
Total all conditions	307,200	18,700	325,900

Increment per acre of uncut stands

The per-acre growth capacity of the several forest conditions is shown in table 10. The increment given in board feet occurred only on saw-timber material; while cubic-foot and cordwood volumes include the increment on the usable length of all pines and under-sawlog-size hardwoods above 5.0 inches d.b.h., and the saw-timber portion of hardwoods 13.0 inches d.b.h. and larger. No increment on cull trees or limbs of any species is included.

Table 10. - Average increment per acre (undisturbed by cutting) in the various forest conditions, 1936

Forest condition	Pine component			Hardwood component			Total per acre		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu ft.	Cords
Old growth:									
Uncut	49	9.1	.11	-13	-6.9	-.10	36	2.2	.01
Partly cut	25	6.1	.08	13	-1.7	-.03	38	4.4	.05
Second growth:									
Sawlog size:									
Uncut	70	15.6	.20	-2	-1.2	-.02	68	14.4	.18
Partly cut	48	10.3	.13	8	1.9	.03	56	12.2	.16
Under sawlog size	15	5.5	.07	7	2.3	.04	22	7.8	.11
Reproduction and clear-cut	2	.4	.01	negl.	negl.	negl.	2	.4	.01
Weighted averages	33	8.2	.10	4	.5	.01	37	8.7	.11

Forest Industries

Sawmills

By far the greater part of the lumber produced in Oklahoma is cut by sawmills operating in this unit. A field canvass of each county in the unit showed that in 1936 at least 75 mills, mostly in Le Flore, Pushmataha, and McCurtain Counties (fig. 6), were actively engaged in manufacturing lumber (table 11). Their total output, which averaged 70 percent of capacity production, was 157 million board feet lumber tally, 90 percent of which was pine. All the saw timber cut by these mills, with minor exceptions, came from within the unit boundary, and as far as could be determined, very few logs, if any, were shipped to mills outside the unit. The 24 sawmills located in McCurtain County produced about 87 million board feet of lumber during 1936, or slightly more than half the total production reported to the Census for the entire State.

Table 11. - Number of sawmills and extent of employment, classified according to size of mill, 1936

Daily (10 hrs) rated capacity1/	Mills 2/			Employment		
	Pine	Hardwood	Total	In woods	In mill	Total
M board feet	Number			Thousand man-days		
Under 20	68	1	69	47	93	140
20 - 39	2	1	3	10	17	27
40 - 79	-	-	-	-	-	-
80 and over	3	-	3	102	202	304
Total	73	2	75	159	312	471

1/ The rated capacity indicates size of mill rather than actual average daily production.

2/ The data given here on the number of mills in the smallest class are estimates based upon all available records, supplemented by a field check.

The field canvass showed that 69 of the mills were small portable outfits, cutting less than 20 M board feet per day. These mills, whose average cut is nearly 800 thousand board feet per year, produced in 1936 about a third of all the lumber produced in the unit that year, operating at about 50 percent of their capacity. Most of the lumber cut by these small mills was finished at concentration yards at Poteau, Antlers, Clayton, Moyers, and Broken Bow, where the higher grades were also kiln dried.

Only 3 mills with a rated capacity of 20 to 39 M board feet per day were reported. One cut pine entirely, one cut both pine and hardwood, and the third cut hardwood entirely. The mill cutting only pine also operated a concentration yard, handling the rough lumber of several small portable mills. Both the mills cutting pine are equipped with circular saws, planer, and dry kiln; while the hardwood mill has a 6-foot band saw. The combined cut of these 3 mills, operating at about 40 percent of capacity was slightly over 8 million feet, or about 5 percent of all the lumber produced in the unit.

Sixty percent of the lumber cut in the unit is produced in three large mills, each of which has a total rated capacity of more than 80 M board feet per day. Two of the mills cut pine entirely, while the other operates one side as a hardwood mill of 30 to 40 thousand board feet capacity. Practically all of their timber is secured from stands classified as old growth. Animal skidding is employed, while the logs are hauled by truck an average of 10 miles and by railroad about 30 miles. These three plants operated at very near full capacity in 1936.

Other forest industries

Within the past few years there has been a decided expansion of the cooperage industry in the unit. In 1936 there were 7 cooperage plants operating, at least 5 of which were built since late 1935. Each of the 7 plants has a daily consumptive capacity of about 20 standard cords of white oak, which is used entirely for the production of tight-cooperage staves. A majority of the plants buy their timber delivered on the yard, but some buy standing timber and have it logged by contractors. These plants secured all of their requirements (amounting to 14,000 cords in 1936) from within the unit, while 2 plants in Arkansas drew an additional 3,000 cords from the unit during the same period.

The only other forest industrial plants found in the unit in 1936 were 3 shingle mills, although it is probable that there are more of these plants, which are small and difficult to locate. The 3 mills reported that they used a total of about 200 cords of wood, all from within the unit.

The production of cross ties, poles and piles, mine timbers, fence posts, and fuel wood required about 40 percent as much wood as the sawmill and cooperage industries combined. Slightly over a half million cross ties were produced in 1936, about 60 percent of which were hardwood; local railroads were the chief consumers. Only a few pine poles and piles were cut, mainly for local use. About 29,000 cords of mine timbers were cut for the coal mines of Haskell and Le Flore Counties and of adjacent coal-producing areas. All of these mine timbers were from trees below sawlog size, and 75 percent of the material was cut from hardwoods. It is estimated that 3,686,000 fence posts were produced, 96 percent of which were hardwood; 70 percent of these were used to fence land within the unit, 29 percent were commercial hardwood posts sold chiefly in the western part of the State, and 1 percent were commercial pine posts sold to treating plants either in Hugo or in Kansas City. Fuel wood, produced chiefly for home consumption by rural dwellers, was estimated to be 212,000 cords. Also a small quantity of wood shipped to veneer mills in Arkansas and Texas supplies a minor amount of woods employment.

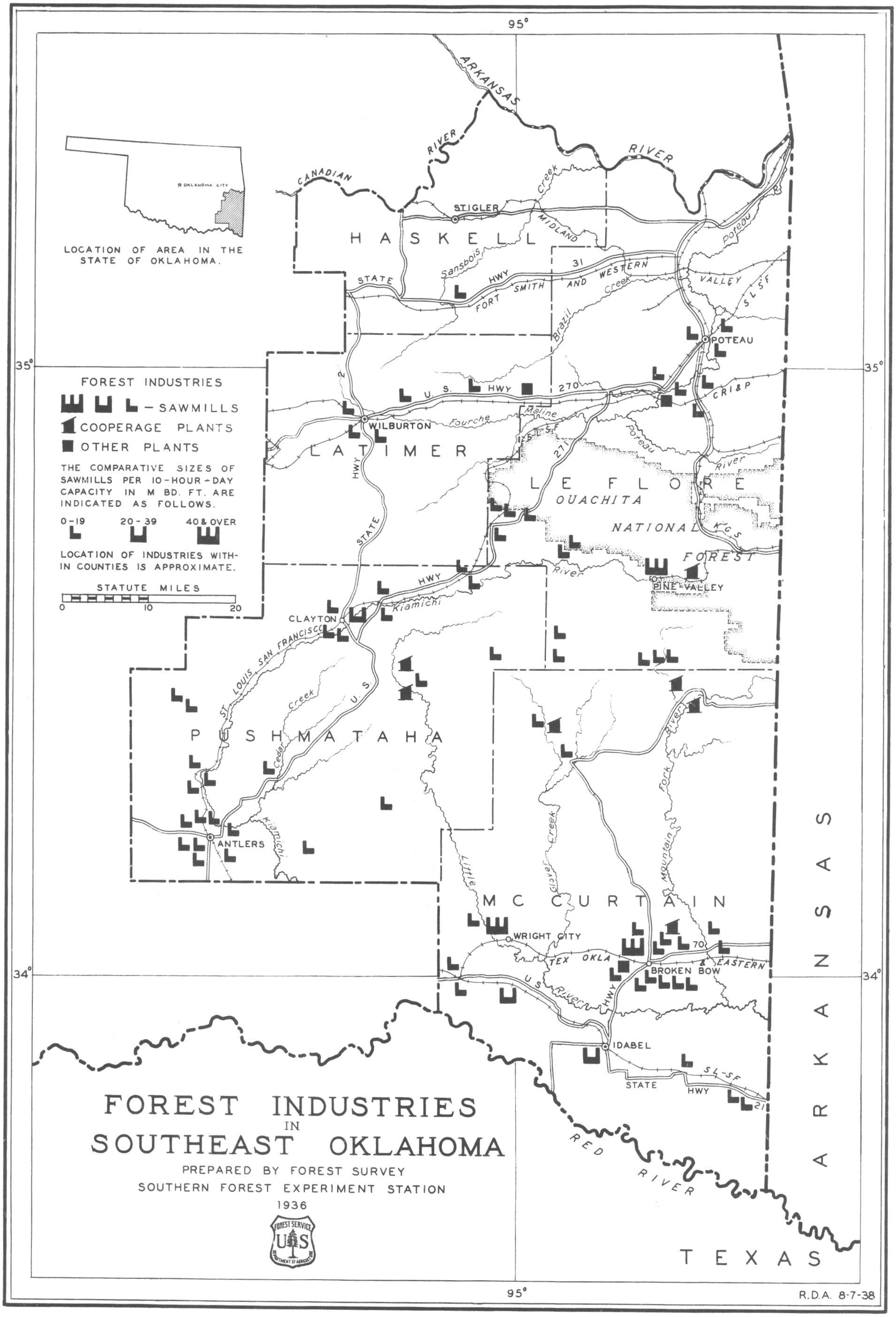
FOREST INDUSTRIES
IN
SOUTHEAST OKLAHOMA
PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1936
FOREST SERVICE
U S
DEPARTMENT OF AGRICULTURE
R.D.A. 8-7-38
95°
35°
34°
LOCATION OF AREA IN THE STATE OF OKLAHOMA.
OKLAHOMA CITY
FOREST INDUSTRIES
- SAWMILLS
COOPERAGE PLANTS
OTHER PLANTS
THE COMPARATIVE SIZES OF SAWMILLS PER 10-HOUR-DAY CAPACITY IN M BD. FT. ARE INDICATED AS FOLLOWS.
0-19
20-39
40 & OVER
LOCATION OF INDUSTRIES WITHIN COUNTIES IS APPROXIMATE.
STATUTE MILES
0
10
20
HASKELL
LATIMER
LE FLORE
PUSHMATAHA
MC CURTAIN
ARKANSAS RIVER
CANADIAN RIVER
RED RIVER
ARKANSAS
TEXAS
STIGLER
POTEAU
WILBURTON
CLAYTON
ANTLERS
PINE VALLEY
WRIGHT CITY
BROKEN BOW
IDABEL
OUACHITA NATIONAL FOREST
MIDLAND VALLEY
FORT SMITH AND WESTERN
STATE HWY 31
U.S. HWY 270
STATE HWY 2
U.S. HWY 271
STATE HWY 70
STATE HWY 21
U.S. HWY
ST. LOUIS SAN FRANCISCO
SL-SF
CRI&P
K.C.S.
TEX OKLA & EASTERN
Sansbois Creek
Brazil Creek
Poteau River
Fourche Maline
Kiamichi River
Cedar Creek
Little River
Glover Creek
Mountain Fork River

FIGURE 6 – FOREST INDUSTRIES MAP.

The production of the various forest industries, together with the incidental employment provided by them, is given in table 12. All the material produced or used, either in plants or as commodities, was taken from the forests of the unit. The mill employment is the total labor furnished by the mills within the unit, while the woods employment is based upon the material cut from within the unit, regardless of where it is manufactured. In this particular area, all the commodities listed in table 12, except a small quantity of veneer, are manufactured locally.

Table 12. - Production and employment data, 1936

Kind of plant or commodity	Number of plants	Amount produced or used	Thousand man-days of employment: In woods	In mill	Total
Sawmills	75	157,300 M bd.ft.	159	312	471
Veneer	-	negl.	negl.	-	negl.
Cross ties	-	517 M pieces	75	-	75
Poles and piles	-	4 M pieces	1	-	1
Fence posts	-	3,686 M pieces	47	-	47
Cooperage	7	14 M cords	16	11	27
Fuel wood	-	212 M cords	264	-	264
Miscellaneous 1/	3	2/ 29 M cords	48	negl.	48
Total	85		610	323	933

1/ Includes 3 shingle mills.
2/ Includes material used for mine props.

Employment

According to table 12, the total employment furnished by the forest industries during 1936 amounted to 933,000 man-days. This employment was distributed over a large proportion of the rural population, as many of the individuals do not work full time in the forest industries. If full-time employment were the rule and if each individual worked 250 days per year, 3,700 workers would be required. The sawmills furnished half of the total employment provided by the forest industries in the unit and nearly three-fourths of that for which wages were received. Of the 471,000 man-days furnished by this industry, 65 percent was furnished by the three mills having a capacity of more than 80 M board feet per day. Unless conditions change materially, these large mills will continue to need an equivalent amount of labor for at least the next 10 years. Aside from the sawmill industry, the production of fuel wood and fence posts required the largest expenditure of labor, accounting for a third of the total. Very little actual cash income is derived from the production of these commodities, however, as they are produced chiefly for home consumption.

Utilization Drain

Unfortunately, the drain upon the forest growing stock was cut without considering the amount of increment that was added to the stand during the year. A comparison of table 8 with table 13 shows that the total increment was 105,200,000 board feet while the drain was 208,900,000 feet, so that the growing stock decreased by 3 percent during the year. Table 13 also shows the amount of wood used by the individual forest industries or for the various commodities. The material expressed in board feet includes drain on the saw-timber section of the tree, both the used and wasted portions; while the volumes given in cubic feet include drain on saw-timber material, upper stems of sawlog-size pines, and trees below saw-timber size but at least 5.0 inches d.b.h. No material cut from limbs or from dead or cull trees is included in either case.

Table 13. - Utilization drain from sound trees, 1936

Commodity	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	M board feet (lumber tally)			M cubic feet (inside bark)		
Lumber	150,200	13,300	163,500	26,570	1,900	28,470
Cross ties	11,200	15,400	26,600	1,910	2,680	4,590
Poles and piles	100	-	100	30	-	30
Veneer	-	300	300	-	50	50
Cooperage	-	10,400	10,400	-	1,480	1,480
Misc. manufactures	negl.	100	100	500	1,480	1,980
Fuel wood	4,300	1,000	5,300	1,910	2,540	4,450
Fence posts	-	-	-	100	1,540	1,640
Misc. farm use and land clearing	1,900	700	2,600	770	800	1,570
Total	167,700	41,200	208,900	31,790	12,470	44,260

Comparison of Increment and Drain

Table 14 presents a summary of the effect of growth, mortality, and utilization drain upon the board-foot growing stock during 1936, expressed in lumber tally. The only conclusion to be drawn from it is that the forests of the unit are being greatly overcut, since total drain is twice as great as the increment.

Table 14. — Balance between increment and drain of saw-timber material

Item	Pines	Hardwoods	Total
	- - - M board feet (lumber tally) - - -		
Net growing stock, Jan. 1, 1936	2,514,300	1,106,500	3,620,800
Growth, 1936	120,800	56,700	177,500
Mortality, 1936	26,500	45,800	72,300
Forest increment, 1936	94,300	10,900	105,200
Utilization drain, 1936	167,700	41,200	208,900
Net change in growing stock, 1936	-73,400	-30,300	-103,700
Net growing stock, Jan. 1, 1937	2,440,900	1,076,200	3,517,100

As these are end figures, however, a further appraisal of the situation may lead to a better understanding of the relation between increment and forest use. In the pine species, it is estimated that nearly 100 million board feet, or 59 percent of the total annual drain, was cut from old-growth timber. In table 8, the increment in old-growth pine is seen to be only 17 million board feet; therefore timber of this quality is being removed nearly 6 times as fast as it is growing. With this large reduction in the forest capital occurring annually, it is estimated that the major portion of the old-growth pine timber will be cut in the next 10 to 15 years. Whether this will mean the end of those plants now operating in virgin timber will depend upon the steps taken to assure a continuing timber crop. The present drain of second-growth pine does not quite equal the board-foot increment, but as the excess of increment over drain was only 9 million feet in 1936, it is apparent that the second-growth forests have scant opportunity to produce the equivalent of the overcut in the old-growth timber. Actually, the sawlog-size conditions of the second-growth stands produced only 56 million board feet of increment, and since these are the stands from which most of the 68 million board feet of second-growth pine was taken, it is obvious that the merchantable second-growth pine stands also are overcut. In the under-sawlog-size pine stands, the increment amounted to 21 million board feet, but as there is little merchantable volume per acre in these stands, most of this increment must be allowed to accumulate for at least several years.

The drain on the hardwood species is about four times the increment. Sixty percent of this drain is from old-growth timber with most of the remainder from sawlog-size second-growth stands. Because of the high mortality, mainly in the old-growth stands, there is no surplus of increment to help satisfy drain requirements. In the stands now below sawlog-size, there was an annual increment of 11 million board feet, but this will generally remain unutilized until these younger stands attain a merchantable volume. Although increment and drain were badly out of balance in 1936, there is an opportunity to alleviate this situation by utilizing the trees that contribute to the excessive mortality. In 1936, the mortality of hardwoods was 46 million board feet, or 5 million more than the total volume of hardwood that was utilized. If the volume lost through mortality in 1936 could have been anticipated and utilized to satisfy a part of the drain requirements, the deficit shown in the table could have been reduced correspondingly. Old-growth stands and old trees in younger stands in the hardwood types are frequently in such poor growing condition that their early removal is indicated, even though it may result in an apparent reduction of the growing stock. Such trees do not contribute to the annual increment.

The effect of increment and drain upon the total sound-tree growing stock above 5.0 inches d.b.h. is presented in cubic feet inside bark in table 15. Although there is an additional large volume of cubic-foot increment in the trees below sawlog size, the drain exceeds increment by nearly 20 million cubic feet. This disparity could be reduced by 8 million feet if cull trees were used for all fuel wood, fence posts, and mine timbers.

Table 15. - Balance between increment and drain in cubic feet

Item	Pines	Hardwoods	Total
	- - M cubic feet (inside bark) - -		
Growing stock, Jan. 1, 1936	625,570	565,630	1,191,200
Growth, 1936	30,060	24,740	54,800
Mortality, 1936	6,260	23,640	29,900
Forest increment, 1936	23,800	1,100	24,900
Utilization drain, 1936	31,790	12,470	44,260
Net change in growing stock, 1936	-7,990	-11,370	-19,360
Net growing stock, Jan. 1, 1937	617,580	554,260	1,171,840

Summary and Future Outlook

Southeast Oklahoma is a mountainous, timbered region, with relatively poor transportation facilities and a declining population. In this area the further expansion of agriculture seems ill-advised because of the general low soil productivity, rugged topography, and severe erosion. The effect of these factors is seen in the high proportion of crop failure, small yields per acre, and high percentage of tax delinquency on farm land.

At present, 74 percent of the unit area is forested. Although only 3 million acres in extent, this timber land is highly important to Oklahoma, as it is the chief source, within the State, of lumber and other forest products. The optimum area to be retained in forest growth can be determined only through an intensive study of the land itself, but in general it appears that more of the upland soils should be used for timber production.

As agriculture has failed to utilize the land profitably, and since coal mining has declined in importance, future opportunities for employment mav depend largely upon growing a forest crop for the wood-using industries. Such employment, however, cannot be increased and made permanent until the unfavorable balance between increment and drain is remedied. In 1936 the drain upon the forest was practically twice the forest increment. If it were not for the large quantity of small trees in the stand, upon which growth is constantly accumulating, such excessive use would mean the exhaustion of the forest, for commercial use, within a few decades. Even now, the large sawmills cutting in old-growth timber must close down within the next 10 or 15 years if their continued operation is predicated upon the use of virgin timber. Should they cease operating, about 75 percent of the wages now received for employment in the forest industries would be lost.

It is essential that the balance between growth and drain be restored if there is to be future security for the wood-using industries and the wage earners of this section of Oklahoma. One way to achieve a balance would be to reduce abruptly the annual commodity drain to about 60 percent of the present annual increment, and to hold the cut at this ratio for several decades until the growing stock of the region becomes built up sufficiently to justify a greater cut. But in the face of the present urgent need for industrial activity as a source of labor, such a course is impractical. The balance must be achieved by increasing the increment rather than by reducing the cut.

By adoption of appropriate forestry measures, it should be possible to double the increment. First should be the establishment of a unit-wide system of fire control that will greatly reduce the annual loss from fire. The State Division of Forestry already has an organization that could be expanded to the requisite size, and with (a) adequate financial support from the State and Federal Governments, and (b) the acceptance of fire-control principles by the local inhabitants, unit-wide fire prevention could become a reality. The elimination of frequent fires will do much to increase the growth of individual trees and will, in itself, greatly increase the density of the stands by preserving trees already established and by allowing new trees to become established. Additional measures, however, are needed, which comprise, in general, the management of the forest under a system of selective cutting. Briefly, this consists of making light cuts at frequent intervals, keeping the cut of growing-stock trees at somewhat less than the increment until full stocking is achieved. In this area an opportunity exists to remove a large volume of cull, dying, and hyper-mature trees, especially in the old-growth hardwoods, to satisfy some of the less exacting drain requirements, so that for the next few years the total cut could safely exceed the volume of increment occurring upon the sound-tree growing stock. Utilization of the volume in the "poor risk" trees will make it possible to reserve some of the increment of the better trees for later use, and at the same time put the forest in much better condition for growth. The ultimate object should be to build up a stand of vigorous, rapid-growing trees that fully utilize the growing space. In addition, where the soil is fertile enough for timber production, areas that will not restock naturally should be planted. Young second-growth stands should be thinned sufficiently to maintain the growth rate, whenever this is economically profitable. Successful application of a selective cutting system to the forest of southeast Oklahoma, coupled with protection from fire, eventually should double the increment as well as increase greatly the quality and value of the timber produced.

Since this area contains almost all the timber supply of the State, it is logical that the State should contribute to a program of increasing forest production on a sustained-yield basis. The maintenance of a State Division of Forestry and an Extension Service is essential if this region is to increase greatly its production of timber. The State appropriation for fire control should be commensurate with the contributions of the Federal Government and private owners; and the task requires that all three participants spend more for this purpose than they are now doing. Taxes on forest land should be levied on an equitable basis throughout the forest area and be held at a minimum. The State should establish demonstration forests and should also establish forests in localities where private enterprise cannot profitably own and manage the forest land. Furthermore, the State should strive to promote new industries that can use forest material now going to waste (e.g., small, low-quality hardwoods). State laws to govern cutting practices would insure that the forest stands were left in a productive condition, would equalize the problem of maintaining good practice among the forest owners, and would help protect the public's interest in its forest resource.

The Federal Government can assist by cooperating with the State in financing fire protection and forestry extension work. In this connection, the training of foresters to assume the duties of county agricultural agents, in heavily timbered counties, has been advocated; this seems very worthwhile. In communities where it is not possible for private capital or the State to manage the forest land, National Forests should be established to serve as demonstration areas and to contribute toward the stabilization of local forest industries. The Federal Government, through its forest experiment stations, should maintain and extend its program of research in silviculture, in management, in forest influences, and in wood utilization. Owing to the long-time character and wide application of much of this research, it is appropriate that it be financed and developed in this manner.

If the present overcutting of the timber resource continues, forest industrial activity must decline in this area. Under present practices, employment in the forest industries will be reduced greatly within the next 20 years. This reduction in employment either will greatly accelerate the movement of population out of the unit or will force more people to turn to agriculture on land that is even now generally incapable of supporting the farm population at a reasonable standard of living; either course will be detrimental to the economic welfare of the region. On the other hand, the above program, which is designed to assure a permanent and increasingly usable forest resource, will go far toward maintaining, or even improving, the economic status of the area through increasing employment and providing more raw material for industry.

It is obvious that the development of the forest stands of southeast Oklahoma to their maximum productivity is no small task, or one that can be accomplished in a decade. It will require a well-planned program of action, continued under strong leadership, over a long period of years. Private landowners alone cannot be expected to make or sustain such an effort; it will require the assistance of both the State and Federal Governments, coordinated with private forest industries and the general public.